

# Glossary

## A

**abiotic components** the non-living components of the biosphere; includes chemical and physical factors

**abiotic factor** a non-living factor that influences an organism

**accommodation** adjustments made by the lens and pupil of the eye for near and distant objects

**acetylcholine** neurotransmitter released from vesicles in the end plates of neurons, which makes the postsynaptic membranes more permeable to  $\text{Na}^+$  ions

**acrosome** the cap found on sperm cells, containing enzymes that permit the sperm cell to move through the outer layers that surround the egg

**action potential** the voltage difference across a nerve cell membrane when the nerve is excited

**active transport** movement of substances across cell membranes against a concentration gradient which uses energy

**active site** the area of an enzyme that combines with the substrate

**ADP** a molecule containing two high-energy phosphate bonds that may be formed by breaking one of the phosphate bonds in ATP; abbreviation of adenosine diphosphate

**adrenal cortex** outer region of the adrenal gland that produces glucocorticoids and mineralocorticoids

**adrenal medulla** found at the core of the adrenal gland, produces epinephrine and norepinephrine

**adrenocorticotrophic hormone (ACTH)** pituitary hormone that promotes cortisol release by the adrenal cortex; also called corticotropin

**aerobic cellular respiration** the set of reactions that takes place in the cell in the presence of oxygen and releases energy stored in glucose

**afferent arteriole** a small branch of the renal artery that carries blood to the glomerulus

**agglutination** the clumping of blood cells caused by antigens and antibodies

**albedo** a term used to describe the extent to which a surface can reflect light that strikes it; an albedo of 0.08 means that 8 % of the light is reflected

**alcohol fermentation** a form of fermentation occurring in yeast in which NADH passes its hydrogen atoms to acetaldehyde, generating carbon dioxide, ethanol, and  $\text{NAD}^+$

**aldosterone** hormone produced by the adrenal cortex that helps regulate water balance by increasing sodium retention and water reabsorption by the kidneys

**allantois** extraembryonic structure that contributes to the blood vessels of the placenta

**allele** one of alternative forms of a gene

**allele frequency** the proportion of gene copies in a population of a given allele

**allopatric speciation** speciation by reproductive isolation

**all-or-none response** a nerve or muscle fibre responds completely or not at all to a stimulus

**allosteric activity** a change in an enzyme caused by the binding of a molecule

**alveoli** sacs of the lung in which gas exchange occurs

**amino acid** a chemical that contains nitrogen; can be linked together to form proteins

**amnion** a fluid-filled extraembryonic structure

**amniotic cavity** the fluid-filled cavity inside the amnion that contains the developing embryo

**amylase** an enzyme that breaks down complex carbohydrates

**anabolic steroids** substances that are designed to mimic many of the muscle-building traits of the sex hormone testosterone

**anaerobic cellular respiration** the set of reactions that takes place in the cell in the absence of oxygen and releases energy stored in glucose

**analogous features** features that are similar in appearance and function, but do not appear to have the same evolutionary origin

**analyze** make an examination of parts to determine the nature, proportion, function, interrelationship, etc. of the whole

**anemia** the reduction in blood oxygen due to low levels of hemoglobin or poor red blood cell production

**aneurysm** a bulge in the weakened wall of a blood vessel, usually an artery

**antagonistic muscles** a pair of skeletal muscles that are arranged in pairs and that work against each other to make a joint move

**antibody** a protein formed within the blood that reacts with an antigen

**anticodon** group of three complementary bases on tRNA that recognizes and pairs with a codon on the mRNA

**antidiuretic hormone (ADH)** a hormone that causes the kidneys to increase water reabsorption

**antigen** a substance, usually protein, that stimulates the formation of an antibody

**antiparallel** parallel but running in opposite directions; the 5' end of one strand of DNA aligns with the 3' end of the other strand in a double helix

**aorta** the largest artery in the body; carries oxygenated blood to the tissues

**aqueous humour** watery liquid that protects the lens of the eye and supplies the cornea with nutrients

**Archaeabacteria** in a six-kingdom system, a kingdom consisting of prokaryotic microorganisms distinct from eubacteria that possess a cell wall not containing peptidoglycan and that live in harsh environments such as salt lakes and thermal vents

**arteriosclerosis** a group of disorders that cause the blood vessels to thicken, harden, and lose their elasticity

**artery** a blood vessel that carries blood away from the heart

**artificial ecosystem** an ecosystem that is planned or maintained by humans

**artificial selection** the process of humans selecting and breeding individuals with the desired traits

**asexual reproduction** the production of offspring from a single parent; offspring inherit the genes of that parent only

**astigmatism** vision defect caused by abnormal curvature of surface of the lens or cornea

**atherosclerosis** a degeneration of blood vessels caused by the accumulation of fat deposits in the inner wall

**ATP** a molecule containing three high-energy phosphate bonds that acts as the primary energy-transferring molecule in living organisms; abbreviation of adenosine triphosphate

**ATP synthase complex** a specialized protein complex embedded in the thylakoid membrane that allows H<sup>+</sup> ions to escape from the lumen and uses the resulting energy to generate ATP

**atrioventricular (AV) node** a small mass of tissue in the right atrioventricular region through which impulses from the sinoatrial node are passed to the ventricles

**atrioventricular (AV) valve** a heart valve that prevents the backflow of blood from a ventricle into an atrium

**atrium** (plural *atria*) a thin-walled chamber of the heart that receives blood from veins

**auditory canal** carries sound waves to the eardrum

**autonomic nervous system** the part of the nervous system that controls the motor nerves that regulate equilibrium, and that is not under conscious control

**autosome** a chromosome not involved in sex determination

**autotroph** an organism that uses the Sun's energy and raw materials to make its own food; a producer

**axon** extension of cytoplasm that carries nerve impulses away from the cell body

## B

**B cell** a lymphocyte, made and processed in the bone marrow, that produces antibodies

**bacteriophage** a virus that infects bacteria

**Barr body** a small, dark spot of chromatin located in the nucleus of a female mammalian cell

**basilar membrane** anchors the receptor hair cells in the organ of Corti

**bedrock** the layer beneath the soil, composed of rock

**beneficial mutation** a mutation that enhances an organism's fitness

**bile salt** a component of bile that breaks down large fat globules

**binomial nomenclature** a method of naming organisms by using two names—the genus name and the species name; scientific names are italicized

**biodiversity** the number of species in an ecosystem

**biogeography** the study of the geographic distribution of life on Earth

**biological oxygen demand (BOD)** the amount of dissolved oxygen needed by decomposers to completely break down the organic matter in a water sample at 20 °C over five days

**biomass** the total dry mass of all the living material in an ecosystem

**biome** a large geographical region with a specific range of temperatures and precipitation, and the organisms that are adapted to those conditions of temperature and precipitation

**biosphere** the narrow zone around Earth that harbours life

**biotic components** the biological or living components of the biosphere

**biotic factor** a living factor that influences an organism

**biotic potential** the maximum number of offspring that a species could produce with unlimited resources

**blastocyst** an early stage of embryo development

**blunt ends** fragment ends of a DNA molecule that are fully base paired, resulting from cleavage by a restriction enzyme

**bottleneck effect** a dramatic, often temporary, reduction in population size, usually resulting in significant genetic drift

**Bowman's capsule** the cuplike structure that surrounds the glomerulus

**breathing** the process of the exchange of air between the lungs and the environment, including inspiration and expiration

**bronchi** the passages from the trachea to the left and right lung

**bronchial asthma** a respiratory disorder characterized by reversible narrowing of the bronchial passages

**bronchiole** the smallest passageways of the respiratory tract

**bronchitis** an inflammation of the bronchial tubes

**buffer** a substance capable of neutralizing acids and bases, thus maintaining the original pH of the solution

## C

**calcitonin** hormone produced by the thyroid gland that lowers calcium levels in the blood

**Calvin cycle** a cyclic set of reactions occurring in the stroma of chloroplasts that fixes the carbon of CO<sub>2</sub> into carbohydrate molecules and recycles coenzymes

**canopy** the upper layer of vegetation in a forest

**capillary** a blood vessel that connects arteries and veins; the site of fluid and gas exchange

**carbohydrate** a molecule composed of sugar subunits that contains carbon, hydrogen, and oxygen in a 1:2:1 ratio

**carbon cycle** the cycle of matter in which carbon atoms move from an inorganic form to an organic form and then back to an inorganic form

**carbon fixation** the process of incorporating CO<sub>2</sub> into carbohydrate molecules

**carbonic anhydrase** an enzyme found in red blood cells that speeds the conversion of carbon dioxide and water to carbonic acid

**cardiac muscle** the involuntary muscle of the heart

**cardiac output** the amount of blood pumped from the heart each minute

**carnivore** an animal that feeds only on other animals

**carrying capacity** the maximum number of individuals of a species that can be supported by an ecosystem

**catalyst** a chemical that regulates the rate of chemical reactions without being altered itself

**cataract** condition that occurs when the lens or cornea becomes opaque, preventing light from passing through

**cell cycle** the sequence of stages through which a cell passes from one cell division to the next

**cellular respiration** the process by which cells break down glucose into carbon dioxide and water, releasing energy

**cellulose** a plant polysaccharide that makes up plant cell walls

**central nervous system (CNS)** the body's coordinating centre for mechanical and chemical actions; made up of the brain and spinal cord

**centriole** small protein body found in the cytoplasm of animal cells that provide attachment for spindle fibres during cell division

**centromere** the structure that holds chromatids together

**cerebellum** part of the hindbrain that controls limb movements, balance, and muscle tone

**cerebral cortex** outer layer of the cerebral hemispheres

**cerebrospinal fluid** cushioning fluid that circulates between the innermost and middle membranes of the brain and spinal cord; it provides a connection between neural and endocrine systems

**cerebrum** largest and most highly developed part of the human brain, which stores sensory information and initiates voluntary motor activities

**cervix** a muscular band that separates the vagina from the uterus

**chemiosmosis** a process for synthesizing ATP using the energy of an electrochemical gradient and the ATP synthase enzyme

**chemoautotroph** an organism that can synthesize organic compounds from inorganic chemicals without using solar energy

**chemoreceptor** a specialized nerve receptor that is sensitive to specific chemicals

**chemosynthesis** the process by which non-photosynthetic organisms convert inorganic chemicals to organic compounds without solar energy

**chlorophyll** the light-absorbing green-coloured pigment that begins the process of photosynthesis

**chloroplast** a membrane-bound organelle in green plant and algal cells that carries out photosynthesis

**cholecystokinin** a hormone secreted by the small intestine that stimulates the release of bile salts

**cholinesterase** enzyme, which breaks down acetylcholine, that is released from presynaptic membranes in the end plates of neurons shortly after acetylcholine

**chorion** the outer extraembryonic structure of a developing embryo that will contribute to the placenta

**chorionic villi** vascular projections of the chorion

**choroid layer** middle layer of tissue in the eye that contains blood vessels that nourish the retina

**chromatin** the complex of DNA and protein that make up chromosomes

**cilia** tiny hairlike structures found on some cells that sweep away foreign debris

**cirrhosis** chronic inflammation of the liver tissue characterized by the growth of nonfunctioning fibrous tissue

**clear-cutting** the removal of all trees in an area

**cleavage** cell division of a zygote, in which the number of cells increases without any change in the size of the zygote

**climax community** the final, relatively stable community reached during successional stages

**closed population** a population in which change in size and density is determined by births and deaths alone

**clumped dispersion** the pattern in which individuals in a population are more concentrated in certain parts of a habitat

**coagulation** the process that occurs when the bonds of a protein molecule are disrupted, causing a permanent change in shape

**cochlea** coiled structure of the inner ear that responds to various sound waves and converts them into nerve impulses

**codominance** the expression of both forms of an allele in a heterozygous individual in different cells of the same organism

**codon** sequence of three bases in DNA or complementary mRNA that serves as a code for a particular amino acid

**coenzyme** an organic molecule synthesized from a vitamin that helps an enzyme to combine with a substrate molecule

**cofactor** an inorganic ion that helps an enzyme combine with a substrate molecule

**coliform bacteria** a type of bacteria that occurs naturally in the intestines of humans and other animals, and indicates the presence of fecal contamination in water

**collecting duct** a tube that carries urine from nephrons to the renal pelvis

**colon** the largest segment of the large intestine, where water reabsorption occurs

**combustion** the chemical reaction that occurs when a substance reacts very quickly with oxygen to release energy

**commensalism** a symbiotic relationship in which one organism benefits and the other organism is unaffected; it is categorized as a +/0 relationship

**community** all the organisms of various species that share a habitat or ecosystem

**compare** examine the character or qualities of two things by providing characteristics of both that point out their mutual similarities and differences

**competitive exclusion** the concept that, if resources are limited, no two species can remain in competition for exactly the same niche indefinitely; also known as Gause's Principle

**competitive inhibitor** a molecule with a shape complementary to a specific enzyme that competes with the substrate for access to the active site of the enzyme and blocks chemical reactions

**complement protein** a plasma protein that helps defend against invading microbes by tagging the microbe for phagocytosis, puncturing cell membranes, or triggering the formation of a mucous coating

**complementary base pairing** pairing of the nitrogenous base of one strand of DNA with the nitrogenous base of another strand

**conclude** state a logical end based on reasoning and/or evidence

**cones** photoreceptors that operate in bright light to identify colour

**consumer** a heterotroph; an organism that must eat producers or other consumers to survive

**continuity of life** a succession of offspring that share structural similarities with those of their parents

**contrast** point out the differences between two things that have similar or comparable natures

**cornea** transparent part of the sclera that protects the eye and refracts light toward the pupil of the eye

**coronary artery** an artery that supplies the cardiac muscle with oxygen and nutrients

**corpus callosum** nerve tract that joins the two cerebral hemispheres

**corpus luteum** a mass of follicle cells that forms within the ovary after ovulation; secretes estrogen and progesterone

**cortex** the outer layer of the kidney

**cortisol** hormone that stimulates the conversion of amino acids to glucose by the liver

**Cowper's (bulbourethral) gland** structure that contributes a mucus rich fluid to the seminal fluid (semen)

**creatine phosphate** a compound in muscle cells that releases a phosphate to ADP and helps regenerate ATP supplies in muscle cells

**criticize** point out the merits and demerits of an item or issue

**crossing over** the exchange of genetic material between two homologous chromosomes

**cytokinesis** the division of cytoplasm

## D

**deamination** removal of an amino group from an organic compound

**decomposer** an organism that feeds on detritus

**define** provide the essential qualities or meaning of a word or a concept; make distinct and clear by marking out the limit

**dehydration synthesis** the process by which larger molecules are formed by the removal of water from two smaller molecules

**deletion** the elimination of a base pair or group of base pairs from a DNA sequence

**ΔN** a variable describing the change in the number of individuals in a population

**denaturation** the process that occurs when the bonds of a protein molecule are disrupted, causing a temporary change in shape

- dendrite** projection of cytoplasm that carries impulses toward the cell body
- denitrification** the process in which nitrates are converted to nitrites and then to nitrogen gas
- density-dependent factor** a factor in an ecosystem that affects members of a population because of the population density
- density-independent factor** a factor in an ecosystem that affects members of a population regardless of population density
- deoxyribose sugar** a sugar molecule containing five carbons that has lost the –OH (hydroxyl group) on its 2' position
- depolarization** diffusion of sodium ions into the nerve cell resulting in a charge reversal
- describe** give a written account or represent the characteristics of something by a figure, model, or picture
- design** construct a plan, i.e., a detailed sequence of actions, for a specific purpose
- determine** find a solution, to a specific degree of accuracy, to a problem by showing appropriate formulas, procedures, and calculations
- detoxify** remove the effects of a poison
- detritus** waste from plants and animals, including their dead remains
- diabetes** chronic disease in which the body cannot produce any insulin or enough insulin, or is unable to use properly the insulin it does make
- diaphragm** a sheet of muscle that separates the organs of the thoracic cavity from those of the abdominal cavity
- diastole** relaxation (dilation) of the heart, during which the atria fill with blood
- dichotomous key** a two-part key used to identify living things; *di* means “two”
- dihybrid cross** a genetic cross involving two genes, each of which has more than one allele
- diploid** refers to twice the number of chromosomes in a gamete
- disaccharide** a sugar formed by the joining of two monosaccharide subunits
- distal tubule** conducts urine from the loop of Henle to the collecting duct
- distinguish** point out the differences between two things that have similar or comparable natures
- divergent evolution** evolution into many different species
- DNA** the molecule that makes up genetic material; abbreviation of deoxyribonucleic acid
- DNA helicase** the enzyme that unwinds double-helical DNA by disrupting hydrogen bonds
- DNA ligase** an enzyme that joins DNA fragments together
- DNA polymerase I** an enzyme that removes RNA primers and replaces them with the appropriate nucleotides during DNA replication
- DNA polymerase III** the enzyme that synthesizes complementary strands of DNA during DNA replication
- DNA replication** the process whereby DNA makes exact copies of itself
- dominant trait** a characteristic that is expressed when one or both alleles in an individual are the dominant form
- doubling time ( $t_d$ )** the time needed for a population that is growing exponentially to double
- duodenum** the first segment of the small intestine
- dynamic equilibrium** describes any system with constant change in which the components can adjust to the changes without disturbing the entire system

## E

- ecological density** population density measured in terms of the number of individuals of the same species per unit area or volume actually used by the individuals
- ecological niche** an organism's role in an ecosystem, consisting of its place in the food web, its habitat, its breeding area, and the time of day at which it is most active
- ecological pyramid** a representation of energy flow in food chains and webs
- ecology** the study of interactions between organisms and their living and non-living environment
- ecosystem** a community and its physical and chemical environment
- ecotone** a transition area between ecosystems
- ectoderm** the outer layer of cells in an embryo
- effector** a cell or organ that produces a physiological response when stimulated by a nerve impulse
- efferent arteriole** a small branch of the renal artery that carries blood away from the glomerulus to the peritubular capillaries
- electron transport chain** a series of progressively stronger electron acceptors; each time an electron is transferred, energy is released
- embolus** a blood clot that dislodges and is carried by the circulatory system to another part of the body
- embryo** the early stages of an animal's development
- emigration** the number of individuals that move away from an existing population per unit of time
- emphysema** a respiratory disorder characterized by an overinflation of the alveoli
- endemic** a term used to describe a species that is found in one location only

**endocrine hormones** chemicals secreted by endocrine glands directly into the blood

**endoderm** the inner layer of cells in an embryo

**endometrium** the glandular inner lining of the uterus

**enterogastrone** a hormone secreted by the small intestine that decreases gastric secretions and motility

**enterokinase** an enzyme of the small intestine that converts trypsinogen to trypsin

**enucleated** the condition where a cell does not contain a nucleus

**environmental resistance** any factor that limits a population's ability to realize its biotic potential when it nears or exceeds the environment's carrying capacity

**enzyme** a protein catalyst that permits chemical reactions to proceed at low temperatures

**epididymis** structure located along the posterior border of the testis, consisting of coiled tubules that store sperm cells

**epiglottis** the structure that covers the glottis (opening of the trachea) during swallowing

**epilimnion** the upper level of a lake, which warms up in summer

**epinephrine (adrenaline)** hormone, produced in the adrenal medulla that accelerates heart rate and body reactions during a crisis (the fight-or-flight response)

**erepsin** an enzyme that completes protein digestion by converting short-chain peptides to amino acids

**erythrocyte** a red blood cell that contains hemoglobin and carries oxygen

**essential amino acid** an amino acid that must be obtained from the diet

**estrogen** hormone that activates development of female secondary sex characteristics, and increased thickening of the endometrium during the menstrual cycle

**Eubacteria** in a six-kingdom system, a kingdom consisting of prokaryotic microorganisms that possess a peptidoglycan cell wall

**eustachian tube** air-filled tube of the middle ear that equalizes pressure between the external and internal ear

**eutrophic** having high nutrient levels

**evaluate** give the significance or worth of something by identifying the good and bad points or the advantages and disadvantages

**explain** make clear what is not immediately obvious or entirely known; give the cause of or reason for; make known in detail

**exploitative competition** interspecific competition that involves consumption of shared resources by individuals of different species, where consumption by one species may limit resource availability to other species

**exponential growth** a pattern of population growth in which the population size increases by a fixed rate per a fixed unit of time

**extensor** the muscle that must contract to straighten a joint

**extracellular fluid (ECF)** fluid that occupies the spaces between cells and tissues; includes plasma and interstitial fluid

**extraembryonic coelom** body cavity between the amnion and the chorion

## F

**facilitated diffusion** transport of substances across cell membrane down a concentration gradient by a carrier in the membrane; does not use energy

**FAD<sup>+</sup>** an electron carrier, accepts electrons in cellular processes; abbreviated form of flavin adenine dinucleotide

**FADH<sub>2</sub>** an electron carrier, donates electrons in cellular processes; reduced form of FAD<sup>+</sup>

**Fallopian tube (oviduct)** one of two tubes that connect the ovaries to the uterus

**farsightedness** condition that occurs when the image is focused behind the retina

**fat** a lipid composed of glycerol and saturated fatty acids; solid at room temperature

**feedback inhibition** the inhibition of an enzyme in a metabolic pathway by the final product of that pathway

**fertilization** fusion of a male and a female sex cell

**fertilizer** a material used to restore nutrients to plants

**fetus** the later stages of an unborn offspring's development

**fibrium** (plural fibria) a fingerlike projection at the end of a Fallopian tube

**filtration** the selective movement of materials through capillary walls by a pressure gradient

**first trimester** the period during pregnancy from conception until the end of the third month

**fitness** an organism's reproductive success

**fixed frequency** the frequency of an allele within a population when only a single allele is present for a particular gene (i.e., the allele's frequency is 100 %)

**flexor** the muscle that must contract to bend a joint

**follicle** structure in the ovary that contains the oocyte

**follicle-stimulating hormone (FSH)** a gonadotropic hormone that in females, promotes the development of the follicles in the ovary; in males, it increases sperm production

**follicular phase** phase marked by development of ovarian follicles before ovulation

**food chain** a sequence linking organisms that feed on each other, starting with a food source and continuing in order with each consumer

**food web** a representation of the feeding relationships among organisms in an ecosystem

**founder effect** genetic drift that results when a small number of individuals separate from their original population and find a new population

**fovea centralis** area at centre of retina where cones are most dense and vision is sharpest

**frameshift mutation** a mutation that causes the reading frame of codons to change

## G

**gallstone** crystals of bile salts that form in the gallbladder

**gametogenesis** the formation of gametes (sex cells) in animals

**ganglion** (plural ganglia) collections of nerve cell bodies located outside the central nervous system

**gastrin** a hormone secreted by the stomach that stimulates the release of HCl

**gastrula** stage of embryonic development in which the embryo is composed of three layers: ectoderm, mesoderm, and endoderm

**gastrulation** process by which a gastrula is formed

**gated ion channel** a pore in the cell membrane that allows ions to move in and out of the cell by opening and closing

**gene** a segment of DNA that performs a specific function, such as coding for a particular protein

**gene expression** conversion of a gene into a specific trait through the production of a particular polypeptide

**gene flow** the movement of alleles from one population to another through the movement of individuals or gametes

**gene mutation** a mutation that changes the coding for amino acids

**gene pool** all the genes in a certain population

**genetic drift** changes to allele frequency as a result of chance

**genetic transformation** introduction and expression of foreign DNA in a living organism

**genotype** the genetic complement of an organism

**genotypic ratio** the ratio of offspring with each possible allele combination from a particular cross

**genus** the first part of a binomial name; a genus includes several species

**glaucoma** disease of the eye in which increased pressure within the eyeball causes a gradual loss of sight

**glial cell** nonconducting cell important for structural support and metabolism of the nerve cells

**glomerulus** the high-pressure capillary bed that is the site of filtration

**glucagon** hormone produced by the pancreas; when blood sugar levels are low, glucagon promotes conversion of glycogen to glucose

**glucocorticoid** any of the steroids produced by the adrenal cortex that help to regulate electrolyte and water balance

**glycogen** a plant carbohydrate used to store energy

**glycolysis** a process for harnessing energy in which a glucose molecule is broken into two pyruvate molecules in the cytoplasm of a cell

**goiter** disorder that causes an enlargement of the thyroid gland

**gonadotropic hormones (gonadotropins)** hormones produced by the pituitary gland that regulate the functions of the testes in males and the ovaries in females

**gonadotropin-releasing hormone (GnRH)** chemical messenger from the hypothalamus that stimulates secretions of FSH and LH from the pituitary

**grana** (singular granum) stacks of thylakoids

**granulosa** the layer of small cells that forms the wall of a follicle

**graphically** using a drawing that is produced electronically or by hand, and that shows a relationship between certain sets of numbers

**groundwater** water in the soil or rock below Earth's surface

**growth rate (gr)** the change in population size per unit of time

## H

**habitat** a place or type of environment with conditions suitable for the survival of an organism or population of organisms

**haploid** refers to the number of chromosomes in a gamete

**harmful mutation** a mutation that reduces an organism's fitness

**helper T cell** a T cell with receptors that bind to fragments of antigens

**hemoglobin** the oxygen-carrying molecule in red blood cells

**herbivore** an animal that eats only plants

**heterotroph** an organism that is incapable of making its own food, and so must feed on other organisms to gain energy

**heterozygous** having different alleles for the same gene

**homeostasis** the process by which a constant internal environment is maintained despite changes in the environment

**homologous chromosomes** paired chromosomes similar in shape, size, gene arrangement, and gene information

**homologous features** features with similar structures but different functions

**homozygous** having identical alleles for the same gene

**hormones** chemicals released by cells that affect cells in other parts of the body

**how** show in what manner or way, with what meaning

**human chorionic gonadotropin hormone (HCG)** an embryonic hormone that maintains the corpus luteum

**human growth hormone (hGH)** hormone produced by the pituitary gland that stimulates growth of the body; also known as somatotropin (STH)

**humus** decaying plant and animal matter

**hydrogen bond** the type of bond that is formed between the positive end of one water molecule and the negative end of another water molecule

**hydrological cycle (water cycle)** the movement of water through the environment from the atmosphere to Earth and back

**hydrolysis** the process by which larger molecules are split into smaller molecules by the addition of water

**hyperpolarization** condition in which the inside of the nerve cell membrane has a greater negative charge than the resting membrane; caused by excessive diffusion of potassium ions out of the cell

**hypolimnion** the lower level of a lake, which remains at a low temperature year round

**hypothalamus** area of the brain that coordinates many nerve and hormone functions

**hypothesize** from a tentative position intended as a possible explanation for an observed phenomenon; i.e., a possible cause for a special effect; the proposition should be testable logically and/or empirically

**identify** recognize and select as having the characteristics of something

**illustrate** make clear by giving an example; the form of the example must be specified in the question; i.e., word description, sketch, or diagram

**immigration** the number of individuals that move into an existing population per unit of time

**implantation** the attachment of the embryo to the endometrium

**inbreeding** the process whereby breeding stock is drawn from a limited number of individuals possessing desirable phenotypes

**incomplete dominance** the expression of both forms of an allele in a heterozygous individual in the cells of an organism, producing an intermediate phenotype

**indicator species** a species sensitive to small changes in environmental conditions

**induced mutation** a mutation caused by a chemical agent or radiation

**infer** form a generalization from sample data; arrive at a conclusion by reasoning from evidence

**inflammatory response** localized nonspecific response triggered when tissue cells are injured by bacteria or physical injury, characterized by swelling, heat, redness, and pain

**inheritance of acquired characteristics** the false concept of inheritance of features acquired during the life of an individual

**inhibitin** a hormone produced by the Sertoli cells that inhibits production of FSH

**inhibiting factor** chemical that inhibits production of a hormone by the anterior pituitary gland

**insertion** the placement of an extra nucleotide in a DNA sequence

**insulin** hormone produced by the islets of Langerhans in the pancreas; insulin is secreted when blood sugar levels are high

**intercostal muscle** a muscle that raises and lowers the rib cage

**interference competition** interspecific competition that involves aggression between individuals of different species who fight over the same resource(s)

**intermembrane space** the fluid-filled space between the inner and outer mitochondrial membranes

**interneuron** a neuron of the central nervous system that connects with sensory, motor, and other interneurons to integrate sensory input with motor output; also known as association neuron

**interphase** the time interval between nuclear divisions when a cell increases in mass, roughly doubles the cytoplasmic components, and duplicates its chromosomes

**interpret** tell the meaning of something; present information in a new form that adds meaning to the original data

**interspecific competition** competition between individuals of different species

**interstitial fluid** the fluid that surrounds the body cells

**intraspecific competition** an ecological interaction in which individuals of the same species compete for resources in their habitat

**inversion** the reversal of a segment of DNA within a chromosome

**iris** opaque disk of tissue surrounding the pupil that regulates amount of light entering the eye

**islets of Langerhans** hormone producing cells of the pancreas; these cells are part of the endocrine system

**isomer** one of a group of chemicals that have the same chemical formula but different arrangements of the atoms

**isotope** one of two or more atoms of the same element containing the same number of protons but a different number of neutrons

## J

**jaundice** the yellowish discoloration of the skin and other tissues brought about by the collection of bile pigments in the blood

**juxtaglomerular apparatus (JGA)** a functional unit near a kidney glomerulus that controls renin release in response to changes in blood pressure

**justify** show reasons for or give facts that support a position

## K

**K** a variable indicating the number of individuals in a population at the carrying capacity of an environment

**K-selected organism** an organism that is adapted to survive at or near the carrying capacity of its environment

**karyotype chart** a picture of chromosomes arranged in homologous pairs

**killer T cell** a T cell that destroys microbes, body cells infected with viruses, and mutated cells by puncturing cell membranes

**Krebs cycle** a cyclic series of reactions that transfers energy from organic molecules to ATP, NADH, and FADH<sub>2</sub>, and removes carbon atoms as CO<sub>2</sub>

## L

**lacteal** a small vessel that transports the products of fat digestion to the circulatory system

**lactic acid fermentation** a form of fermentation occurring in animal cells in which NADH transfers its hydrogen atoms to pyruvate, regenerating NAD<sup>+</sup> and lactic acid

**lactic acid threshold** the value of exercise intensity at which lactic acid production increases

**lag phase** the initial stage in which population growth rates are slow as a result of a small population size; characteristic of geometric, exponential, and logistic population growth

**lagging strand** the new strand of DNA that is synthesized away from the replication fork and in short fragments, which are later joined together

**lamellae** (singular lamella) groups of unstacked thylakoids between grana

**larynx** the voice box

**law of the minimum** states that the nutrient in the least supply is the one that limits growth

**law of tolerance** states that an organism can survive within a particular range of an abiotic factor

**leaching** the removal of soluble minerals by percolation

**leading strand** the new strand of DNA that is synthesized towards the replication fork and continuously during DNA replication

**leukocyte** a white blood cell

**light-dependent reactions** the first set of reactions of photosynthesis in which light energy excites electrons in chlorophyll molecules, powers chemiosmotic ATP synthesis, and results in the reduction of NADP<sup>+</sup> to NADPH

**light-independent reactions** The second set of reactions in photosynthesis (the Calvin cycle); these reactions do not require solar energy

**limnetic zone** the area of a lake or pond in which there is open water and sufficient light for photosynthesis to occur

**LINEs** repeated DNA sequences 5000 to 7000 base pairs long that alternate with lengths of DNA sequences found in the genomes of higher organisms

**linkage group** a group of linked genes on a chromosome

**linked genes** genes that are located on the same chromosome

**lipase** a lipid-digesting enzyme

**litter** the upper layer of soil, composed mainly of partially decomposed leaves or grasses

**littoral zone** the area from the shore of a lake or pond to the point where no more plants grow in the lake bottom

**locus** (plural loci) a specific location along a chromosome where a particular gene is found

**log phase** the stage in which population growth rates are very rapid; characteristic of exponential and logistic growth

**logistic growth** a model of population growth describing growth that levels off as the size of the population approaches its carrying capacity

**loop of Henle** the section of the tubule that carries filtrate from the proximal tubule to the distal tubule

**luteal phase** phase of the menstrual cycle characterized by the formation of the corpus luteum following ovulation

**luteinizing hormone (LH)** a gonadotropin, in females, promotes ovulation and the formation of the corpus luteum; in males, it regulates the production of testosterone

**lymph** the fluid found in lymph vessels that contains some proteins that have leaked through capillary walls

**lymph node** a mass of tissue that stores lymphocytes and removes bacteria and foreign particles from the lymph

**lymphocyte** a white blood cell that produces antibodies

**lymphokine** a protein produced by the T cells that acts as a chemical messenger between other T cells and B cells

## M

**macrophage** a phagocytic white blood cells found in lymph nodes, bone marrow, and the spleen and liver

**marker gene** a gene that confers an easily identifiable phenotype and is used to trace the inheritance of other genes that are difficult to identify; the marker gene must be located on the same chromosome, and ideally, at a very small distance from the gene being followed

**maximum oxygen consumption ( $\text{VO}_2 \text{ max}$ )** the maximum volume of oxygen, in millilitres, that the cells of the body can remove from the bloodstream in one minute per kilogram of body mass while the body experiences maximal exertion

**medulla oblongata** region of the hindbrain that joins the spinal cord to the cerebellum; one of the most important sites of autonomic nerve control

**medulla** the area inside of the cortex

**meiosis** two-stage cell division in which the chromosome number of the parental cell is reduced by half

**memory B cell** a B cell that retains information about the shape of an antigen

**meninges** protective membranes that surround the brain and spinal cord

**menopause** the termination of the female reproductive years

**menstrual cycle** an almost-monthly cycle in which the endometrial lining of the uterus prepares for pregnancy; if pregnancy does not occur the lining is shed at menstruation

**menstruation (flow phase)** the shedding of the endometrium during the menstrual cycle

**mesoderm** the middle layer of cells in an embryo

**messenger RNA (mRNA)** the product of transcription of a gene; mRNA is translated by ribosomes into protein

**methylase** an enzyme that adds a methyl group to one of the nucleotides found in a restriction endonuclease recognition site

**microvilli** microscopic, fingerlike projections of the cell membrane

**mineralocorticoid** any of the steroids produced by the adrenal cortex that regulate carbohydrate, lipid, and protein metabolism and inhibit the release of corticotrophin

**minimum viable population size** the smallest number of individuals needed for a population to continue for a given period of time

**missense mutation** a mutation that results in the single substitution of one amino acid in the resulting polypeptide

**mitochondrial matrix** the fluid that fills the interior space of the mitochondrion

**mitochondrion** a eukaryotic cell organelle in which aerobic cellular respiration occurs

**mitosis** a type of cell division in which a daughter cell receives the same number of chromosomes as the parent cell

**Monera** in a five-kingdom system, a kingdom that includes organisms that lack a true nucleus

**monoculture** cultivation of a single species

**monosaccharide** a single sugar unit

**monosomy** the condition in which there is a single chromosome in place of a homologous pair

**mortality** the number of deaths per unit of time

**motor neuron** neuron that carries impulses from the central nervous system to an effector; also known as efferent neuron

**mucus** a protective lubricating substance composed mostly of protein

**multiple-cloning site** a region in a vector that is engineered to contain the recognition site of a number of restriction enzymes

**muskeg** soil above the permafrost that is swampy or boggy in summer

**mutagenic agent** an agent that can cause a mutation

**mutant** any allele of a gene other than the wild type allele

**mutation** a change in the DNA sequence in a chromosome

**mutualism** a symbiotic relationship in which both organisms benefit; as neither is harmed, it is categorized as a  $+/+$  relationship

**myelin sheath** insulated covering over the axon of a nerve cell

**myofilament** a thread of contractile proteins found within muscle fibres

**myogenic muscle** muscle that contracts without external nerve stimulation

## N

**N** a variable describing the number of individuals in a population

**NAD<sup>+</sup>** an electron carrier, accepts electrons in cellular processes; abbreviation of nicotinamide adenine dinucleotide

**NADH** an electron carrier, donates electrons in cellular processes; reduced form of NAD<sup>+</sup>

**NADP<sup>+</sup>** a compound that accepts one hydrogen atom and two electrons, forming NADPH; is an electron acceptor; abbreviation of nicotinamide adenine dinucleotide phosphate

**NADPH** a compound that donates one hydrogen atom and two electrons to another molecule, to reform NADP<sup>+</sup>; is an electron donor

**natality** the number of births per unit of time

**natural ecosystem** an ecosystem in which the interactions are not changed purposely by human actions

**natural selection** the result of differential reproductive success of individuals caused by variations in their inherited characteristics

**nearsightedness** condition that occurs when the image is focused in front of the retina

**negative feedback** the process by which a mechanism is activated to restore conditions to their original state

**nephron** a functional unit of the kidney

**neurilemma** delicate membrane that surrounds the axon of some nerve cells

**neuron** nerve cell that conducts nerve impulses

**neurotransmitter** chemical messenger released by the presynaptic neuron that binds to receptors on the postsynaptic neuron

**neutral mutation** a mutation that has no effect on the organism

**nitrogen cycle** a cycle of matter in which nitrogen atoms move from nitrogen gas in the atmosphere, to inorganic forms in the soil, to organic forms in living things, and then back to inorganic forms in the soil and nitrogen gas in the atmosphere

**nitrogen fixation** two processes in which atmospheric or dissolved nitrogen is converted into nitrate ions

**nitrogenous base** an alkaline, cyclic molecule containing nitrogen

**nodes of Ranvier** regularly occurring gaps between sections of myelin sheath along the axon

**nondisjunction** the failure of a pair of homologous chromosomes to separate properly during meiosis

**nonsense mutation** a mutation that converts a codon for an amino acid into a stop codon

**norepinephrine** also known as noradrenaline, it initiates the fight-or-flight response by increasing heart rate and blood sugar

**nucleotide** a molecule having a five-carbon sugar with a nitrogenous base attached to its 1' carbon and a phosphate group attached to its 5' carbon

**nutrient** a substance that provides the raw materials required for cell metabolism and growth

## O

**oil** a lipid composed of glycerol and unsaturated fatty acids; liquid at room temperature

**olfactory bulb** area of the brain that processes information about smell; one bulb in each hemisphere

**oligotrophic** having low nutrient levels

**omnivore** an animal that eats both plants and other animals

**oocyte** an immature ovum

**ogenesis** the formation and development of mature ova

**ootid** an unfertilized ovum

**open population** a population in which change in number and density is determined by births, deaths, immigration, and emigration

**organ of Corti** primary sound receptor in the cochlea

**osmoreceptors** sensory receptors in the hypothalamus that detect changes in the osmotic pressure of the blood and surrounding extracellular fluids (ECF)

**ossicles** tiny bones that amplify and carry sound in the middle ear

**otoliths** tiny stones of calcium carbonate embedded in a gelatinous coating within the saccule and utricle

**outline** give, in an organized fashion, the essential parts of something; the form of the outline must be specified in the question; i.e., lists, flow charts, concept maps

**oval window** oval-shaped hole in the vestibule of the inner ear, covered by a thin layer of tissue

**ovaries** (singular ovary) the female gonads, or reproductive organs; female sex hormones and egg cells are produced in the ovaries

**ovulation** release of the secondary oocyte from the follicle held within the ovary

**ovulatory phase** phase in which ovulation occurs

**ovum** (plural ova) egg cell

**oxidation** a reaction in which an atom or molecule loses electrons

**oxidative ATP synthesis** the production of ATP from a series of oxidation reactions

**oxyhemoglobin** hemoglobin that is bound to oxygen

**oxytocin** a hormone from the pituitary gland; causes strong uterine contractions

**ozone ( $O_3$ )** an inorganic molecule; a layer of ozone found in the stratosphere helps to screen out ultraviolet radiation

## P

**paleontology** the study of fossils

**palindromic** reading the same backwards and forwards

**parasitism** a symbiotic relationship in which one organism (the parasite) benefits at the expense of another organism (the host), which is often harmed but usually not killed; it is categorized as a +/-

**parasympathetic nervous system** a division of the autonomic nervous system that returns the body to normal resting levels following adjustments to stress

**parathyroid glands** four pea-sized glands in the thyroid gland that produce parathyroid hormone to regulate blood calcium and phosphate levels

**parathyroid hormone (PTH)** hormone produced by the parathyroid glands, which will increase calcium levels in the blood and lower the levels of phosphates

**parturition** the act of giving birth; labour

**peat** slowly decomposing plant matter produced in low-oxygen environments such as bogs

**pedigree chart** a chart used to record the transmission of a particular trait or traits over several generations

**pepsin** a protein-digesting enzyme produced in the stomach

**peptide bond** the bond that joins amino acids

**per capita growth rate (cgr)** the change in population size relative to the initial size of the population, per unit time

**percolation** the movement of a liquid through a porous material, such as soil particles

**peripheral nervous system (PNS)** all parts of the nervous system, excluding brain and spinal cord, that relay information between the central nervous system and other parts of the body

**peristalsis** rhythmic, wavelike contractions of muscle that move food along the gastrointestinal tract

**peritubular capillary** a member of the network of small blood vessels that surround the tubule of the nephron

**permafrost** permanently frozen soil

**phagocytosis** the process by which a white blood cell engulfs and chemically destroys a microbe

**phenotype** the observable characteristics of an organism

**phenotypic ratio** the ratio of offspring with a dominant trait to the alternative, recessive trait

**phosphate group** a group of four oxygen atoms surrounding a central phosphorus atom; found in the backbone of DNA

**phospholipid** a lipid with a phosphate molecule attached to the glycerol backbone, making the molecule polar; the major components of cell membranes

**phosphorus cycle** the cycling of phosphorus between the biotic and abiotic components of the environment; consists of a biological and geochemical cycle

**photolysis** a chemical reaction in which a compound is broken down by light; in photosynthesis, water molecules are split by photolysis

**photon** a packet of light

**photosynthesis** the process by which green plants and some other organisms use solar energy, carbon dioxide, and water to produce carbohydrates

**photosystem** a cluster of photosynthetic pigments embedded in a thylakoid membrane of a chloroplast that absorbs light energy

**phylogeny** proposed evolutionary history of a species or group of organisms

**pinna** outer part of the ear that acts like a funnel, taking sound from a large area and channelling it into a small canal

**pioneer community** the first species to appear during succession

**pituitary gland** gland at the base of the brain that, together with the hypothalamus, functions as a control centre, coordinating the endocrine and nervous systems

**placenta** the site for the exchange of nutrients and wastes between mother and fetus

**plan** construct a plan, i.e., a detailed sequence of actions, for a specific purpose

**plankton** autotrophic and heterotrophic microorganisms found in the limnetic zone of a lake or pond

**plasma** the fluid portion of the blood

**plasmid** a small double-stranded circular DNA molecule found in some bacteria

**platelet** a component of blood responsible for initiating blood clotting

**pleural membrane** a thin membrane that surrounds the outer surface of the lungs and lines the inner wall of the chest cavity

**pluripotent cell** a cell that is capable of developing into a number of specialized cells, such as a neuron or muscle cell

**point mutation** a mutation at a specific base pair

**polar body** cell that contains all the genetic information of a haploid ovum, but lacks sufficient cytoplasm to survive; formed during meiosis in females

**polar molecule** a molecule that has a positive and a negative end

**polarized membrane** membrane charged by unequal distribution of positively charged ions inside and outside the nerve cell

**polymer** a molecule composed of three or more subunits

**polymerase chain reaction (PCR)** a technique for amplifying a DNA sequence by repeated cycles of strand separation and replication

- polypeptide** a chain of three or more amino acids
- polyploidy** a condition in which an organism has more than two complete sets of chromosomes
- polysaccharide** a carbohydrate composed of many single sugar subunits
- pons** region of the brain that acts as a relay station by sending nerve messages between the cerebellum and the medulla
- population** a group of organisms of the same species that live in the same habitat or ecosystem at the same time
- population density** the number of individuals of the same species that occur per unit area or volume
- population dispersion** the general pattern in which individuals are distributed through a specified area
- population size** the number of individuals of a specific species occupying a given area/volume at a given time
- positive feedback** the process by which a small effect is amplified
- postsynaptic neuron** neuron that carries impulses away from the synapse
- precursor activity** the activation of the last enzyme in a metabolic pathway by the initial substrate
- predation** an ecological interaction in which a predator (a member of one species) kills and consumes prey (usually a member of another species)
- predict** tell in advance on the basis of empirical evidence and/or logic
- prescribed burn** a controlled fire set intentionally in a designated area
- presynaptic neuron** neuron that carries impulses to the synapse
- primary sexual characteristics** physical characteristics of an organisms that are directly involved in reproduction
- primary succession** the occupation, by plant life, of an area not previously covered by vegetation
- primary consumer** in a food chain or food web, an organism that relies directly on autotrophs for its source of energy; organisms at the second trophic level
- producer** an autotroph; an organism that makes its own food
- profundal zone** the region of a lake beneath the limnetic zone, in which there is insufficient light for photosynthesis to occur
- progeny** new individuals that result from reproduction; offspring
- progesterone** hormone produced primarily by the corpus luteum, that induces changes in the endometrium during the menstrual cycle
- prolactin** a hormone produced by the pituitary gland and associated with milk production
- promoter** sequence of DNA in front of a gene that binds RNA polymerase
- prostaglandins** a group of hormones that act on the cells that produce them in response to cell damage; produced by most cells
- prostate gland** structure that contributes to the seminal fluid (semen), a secretion containing buffers that protect sperm cells from the acidic environment of the vagina
- protein** a chain of amino acids that form the structural parts of cells or act as antibodies or enzymes
- Protista** a kingdom originally proposed for all unicellular organisms such as the amoeba; more recently, multicellular algae have been added to the kingdom
- prove** establish the truth or validity of a statement for the general case by giving factual evidence or logical argument
- proximal tubule** the section of the nephron joining the Bowman's capsule with the loop of Henle
- pulmonary circulatory system** the system of blood vessels that carries deoxygenated blood to the lungs and oxygenated blood back to the heart
- pulse** change in the diameter of the arteries following heart contractions
- Punnett square** a chart used to determine the predicted outcome of a genetic cross
- Purkinje fibre** a nerve fibre that branches and carries electrical impulses throughout the ventricles
- pus** a thick liquid composed of protein fragments from digested leukocytes and microbes

## R

- r** a variable indicating the rate of increase of a population experiencing exponential growth; *r* is limited only by the biotic potential of the organisms in the population
- r-selected organism** an organism that is adapted to increase population size rapidly
- radioisotope** an unstable isotope that decays spontaneously by emitting radiation
- radiometric dating** a technique used to determine the age of a rock or fossil
- random dispersion** the pattern in which individuals are spread throughout a habitat in an unpredictable and patternless manner
- receptor sites** a port along a cell membrane into which hormones, nutrients, and other needed materials fit
- recessive lethal** a trait that, when both recessive alleles are present, results in death or severe malformation of the

offspring; usually, recessive traits occur more frequently in males

**recessive trait** a characteristic that is expressed only when both alleles in an individual are the recessive form

a specific sequence within double-stranded DNA that a restriction endonuclease recognizes and cuts

**recombinant DNA** fragment of DNA composed of sequences originating from at least two different sources

**reduction** a reaction in which an atom or molecule gains electrons

**reflex arc** neural circuit through the spinal cord that provides a framework for a reflex action

**refractory period** recovery time required before a neuron can produce another action potential

**relate** show logical or causal connection between things

**relaxin** a hormone produced by the placenta prior to labour; causes the ligaments within the pelvis to loosen

**releasing hormone** a peptide produced by the hypothalamus that stimulates the anterior pituitary gland to release a stored hormone; also called a releasing factor

**renal pelvis** the hollow area where the kidney joins the ureter

**repolarization** process of restoring the original polarity of the nerve membrane

**resource partitioning** avoidance of, or reduction in, competition for similar resources by individuals of different species occupying different non-overlapping ecological niches

**respiration** all processes involved in the exchange of oxygen and carbon dioxide between cells and the environment, including breathing, gas exchange, and cellular respiration

**respiratory membrane** the membrane where the diffusion of oxygen and other gases occurs between the living cells of the body and the external environment (the atmosphere or water)

**resting potential** voltage difference across a nerve cell membrane when it is not transmitting a nerve impulse (usually negative)

**restriction endonuclease** an enzyme that cuts double-stranded DNA into fragments at a specific sequence; also known as a restriction enzyme

**retina** innermost layer of tissue at the back of the eye containing photoreceptors

**rhodopsin** the pigment found in the rods of the eye

**ribonucleic acid (RNA)** a nucleic acid consisting of nucleotides comprised of the sugar ribose and nitrogenous bases

**ribosome** an organelle composed of RNA and protein and located in the cytoplasm that carries out protein synthesis

**RNA polymerase** enzyme that transcribes DNA

**rods** photoreceptors that operate in dim light to detect light in black and white

## S

**saltatory conduction** generation of action potentials only at nodes of Ranvier in myelinated axons, resulting in rapid transmission of nerve impulses

**sarcolemma** the delicate sheath that surrounds muscle fibres

**Schwann cell** special type of glial cell that produces the myelin sheath

**sclera** outer covering of the eye that supports and protects the eye's inner layers; usually referred to as the white of the eye

**scrotum** the sac that contains the testes

**second trimester** the period during pregnancy from the fourth month to the end of the sixth month

**secondary sexual characteristics** external features of an organism that are indicative of its gender (male or female), but are not the reproductive organs themselves

**secondary succession** succession in an area that was previously covered by vegetation and still has some soil

**secondary consumer** in a food chain or food web, an organism that relies on primary consumers for its principal source of energy; organisms at the third trophic level

**secretin** a hormone released from the duodenum that stimulates pancreatic and bile secretions

**segregation** the separation of alleles during meiosis

**selective breeding** the crossing of desired traits from plants or animals to produce offspring with both characteristics

**selective cutting** the harvesting of only certain trees from an area

**semen (seminal fluid)** a secretion of the male reproductive organs that is composed of sperm and fluids

**semicircular canals** fluid-filled structures within the inner ear that provide information about dynamic equilibrium

**semiconservative replication** process of replication in which each DNA molecule is composed of one parent strand and one newly synthesized strand

**semilunar valves** a valve that prevents the backflow of blood from an artery into a ventricle

**seminal vesicles** structure that contributes to the seminal fluid (semen), a secretion that contains fructose and prostaglandins

**seminiferous tubules** coiled ducts found within the testes, where immature sperm cells divide and differentiate

**sensory adaptation** occurs once you have adjusted to a change in the environment; sensory receptors become less sensitive when stimulated repeatedly

**sensory neuron** neuron that carries impulses to the central nervous system; also known as afferent neuron

**sensory receptor** highly modified dendrites of a sensory neuron that are activated by an environmental stimulus

**septum** a wall of muscle that separates the right and left sides of the heart

**Sertoli cell** a cell that provides metabolic and mechanical support to developing sperm cells

**sex hormone** any hormone that affects the development and growth of sex organs

**sex-linked trait** trait that is determined by genes located on the sex chromosomes

**sexual dimorphism** striking differences in the physical appearance of males and females not usually applied to behavioural differences between sexes

**sexual selection** differential reproductive success that results from variation in the ability to obtain mates; results in sexual dimorphism and mating and courtship behaviours

**sexual reproduction** the production of offspring by the union of sex cells from two different parents; the offspring inherit a combination of genes from both parents

**show how** show reasons for or give facts that support a position

**siblings** offspring from the same parent (in asexual reproduction) or parents (in sexual reproduction)

**silent mutation** a mutation that does not result in a change in the amino acid coded for

**SINEs** repeated DNA sequences 300 base pairs long that alternate with lengths of DNA sequences found in the genomes of higher organisms

**sinoatrial (SA) node** a small mass of tissue in the right atrium that originates the impulses stimulating the heartbeat

**sister chromatids** a chromosome and its duplicate, attached to one another by a centromere until separated during mitosis

**skeletal muscle** the voluntary muscle that makes the bones of the skeleton move

**sketch** provide a drawing that represents the key features of an object or graph

**slash-and-burn** the complete clearing of a forest by felling and burning the trees

**smooth muscle** the involuntary muscle found in the lining of many organs

**social parasite** a parasite that completes its life cycle by manipulating the social behaviour of its hosts

**sodium-potassium pump** a transporter in the cell membrane that moves potassium ions into the cytoplasm while simultaneously removing sodium ions from the cytoplasm to the extracellular fluid

**somatic cell** any cell in a multicellular organism that is not a reproductive cell

**speciation** the formation of new species

**species** a group of organisms that look alike and can interbreed under natural conditions to produce fertile offspring

**spermatid** an immature sperm cell that arises from division of a spermatocyte

**spermatocyte** a cell that arises from division of spermatogonia during spermatogenesis

**spermatogenesis** process by which spermatogonia divide and differentiate into mature sperm cells

**spermatogonia** sperm-producing cells found in the seminiferous tubules

**sphincter** a constrictor muscle that regulates the opening and closing of a tubelike structure

**sphygmomanometer** a device used to measure blood pressure

**spindle fibre** protein structure that guides chromosomes during cell division

**spleen** a lymphoid organ that acts as a reservoir for blood and a filtering site for lymph

**spontaneous mutation** a mutation occurring as a result of errors made in DNA replication

**spontaneous generation** the belief that living things arose from non-living matter

**starch** a plant carbohydrate used to store energy

**start codon** specific codon (AUG) that signals the start of translation

**stationary phase** the phase in which population growth rates approach zero as the population size reaches the carrying capacity and stabilizes; the defining characteristic of logistic population growth

**stem cell** a cell from which any other type of cell can arise; any precursor cell

**sticky ends** fragment ends of a DNA molecule with short single stranded overhangs, resulting from cleavage by a restriction enzyme

**stop codon** specific codon that signals the end of translation

**stroke volume** the quantity of blood pumped with each beat of the heart

**stroma** the protein-rich semiliquid material in the interior of a chloroplast

**stromatolite** a banded limestone structure containing fossilized bacteria

**subsoil** the soil layer beneath the topsoil, usually containing more rock particles and less organic matter than the topsoil

**substrate** a molecule on which an enzyme works

**succession** the slow, progressive replacement of one community by another during the development of vegetation in any area

**summarize** give a brief account of the main points

**summation** increased muscle contraction produced by the accumulation of neurotransmitters from two or more neurons

**suppressor T cell** a T cell that turns off the immune system

**symbiosis** various interactions in which two species maintain a close, usually physical, association; includes parasitism, mutualism, and commensalism

**sympathetic nervous system** a division of the autonomic nervous system that prepares the body for stress

**synapse** a region between neurons, or between neurons and effectors; also known as the synaptic cleft

**synapsis** the pairing of homologous chromosomes

**systemic circulatory system** the system of blood vessels that carries oxygenated blood to the tissues of the body and deoxygenated blood back to the heart

**systole** contraction of the heart, during which blood is pushed out of the heart

## T

**T cell** a lymphocyte, manufactured in the bone marrow and processed by the thymus gland, that identifies and attacks foreign substances

**taxon** (plural *taxa*) categories used to classify organisms

**taxonomy** the science of classification according to the inferred (presumed) relationships among organisms

**telomere** the cap at the end of a chromosome

**template** a single-stranded DNA sequence that acts as the guiding pattern for producing a complementary DNA strand

**template strand** the strand of DNA that the RNA polymerase uses as a guide to build complementary mRNA

**tendon** a band of connective tissue that joins muscle to bone

**teratogen** any medication, chemical, infectious disease, or environmental agent that might interfere with the normal development of a fetus or embryo

**termination sequence** sequence of bases at the end of a gene that signals the RNA polymerase to stop transcribing

**test cross** the cross of an individual of unknown genotype to an individual that is fully recessive

**testes** the male gonads, or primary reproductive organs; male sex hormones and sperm are produced in the testes

**testosterone** male sex hormone produced by the interstitial cells of the testes

**tetanus** the state of constant muscle contraction caused by sustained nerve impulses

**tetrad** a pair of homologous chromosomes, each with two chromatids

**thalamus** area of brain that coordinates and interprets sensory information and directs it to the cerebrum

**theory of gradualism** the idea that speciation takes place slowly

**theory of punctuated equilibrium** the idea that species evolve rapidly, followed by a period of little or no change

**thermocline** the zone between the epilimnion and hypolimnion, in which temperature changes rapidly

**thermodynamics** a scientific study of energy transformations, described by laws

**thermoregulation** maintenance of body temperature within a range that enables cells to function efficiently

**third trimester** the period during pregnancy from the seventh month until birth

**threshold level** minimum level of a stimulus required to produce a response; the maximum amount of a substance that can be moved across the nephron in the kidney

**thrombus** a blood clot that forms within a blood vessel and blocks it

**thylakoid** a system of interconnected flattened membrane sacs forming a separate compartment within the stroma of a chloroplast

**thylakoid lumen** the fluid-filled space inside a thylakoid

**thylakoid membrane** the photosynthetic membrane within a chloroplast that contains light-gathering pigment molecules and electron transport chains

**thymus gland** a lymphoid organ in which T lymphocytes mature

**thyroid gland** a two-lobed gland at the base of the neck that regulates metabolic processes

**thyroxine (T4)** hormone produced by the thyroid gland that increases metabolism and regulates growth

**topsoil** the soil layer beneath the litter, composed of small particles of rock mixed with humus

**trachea** the windpipe

**transcription** the process of converting DNA into messenger RNA

**transfer RNA (tRNA)** the form of RNA that delivers amino acids to a ribosome during translation

**transgenic** a cell or an organism that is transformed by DNA from another species

**translation** the process of synthesizing a specific polypeptide as coded for by messenger RNA

**translocation** the transfer of a fragment of DNA from one site in the genome to another location

**transpiration** the loss of water through plant leaves

**triglyceride** a lipid composed of glycerol and three fatty acids

**triiodothyronine (T<sub>3</sub>)** hormone produced by the thyroid gland that increases metabolism and regulates growth; contains three iodine atoms

**trisomy** the condition in which there are three homologous chromosomes in place of a homologous pair

**trophic hormone** hormone that stimulates a specific target gland to secrete other hormones

**trophic level** a category of living things defined by how it gains its energy; the first trophic level contains autotrophs, and each higher level contains heterotrophs

**trypsin** a protein-digesting enzyme

**tympanic membrane** thin layer of tissue that receives sound vibrations, also known as the eardrum

## U

**ulcer** a lesion on the surface of an organ

**ultraviolet radiation** electromagnetic radiation from the Sun that can cause burning of the skin (sunburn) and cellular mutations

**umbilical cord** structure that connects the fetus to the placenta

**understorey** below the canopy layer; usually shrubs and smaller trees

**uniform dispersion** the pattern in which individuals are equally spaced throughout a habitat

**urea** nitrogen waste formed from two molecules of ammonia and one molecule of carbon dioxide

**ureter** a tube that conducts urine from the kidney to the bladder

**urethra** the tube that carries urine from the bladder to the exterior of the body

**uric acid** a waste product formed from the breakdown of nucleic acids

**uterus (womb)** the hollow, pear-shaped organ located between the bladder and the anus in females

## V

**vagina** the muscular canal extending from the cervix to the outer environment; the birth canal

**vagus nerve** major cranial nerve that is part of the parasympathetic nervous system

**vas deferens** tube that conducts sperm toward the urethra

**vasoconstriction** the narrowing of blood vessels, allowing less blood to the tissues

**vasodilation** the widening of blood vessels, allowing more blood to the tissues

**vector** a vehicle by which foreign DNA may be introduced into a cell

**vein** a blood vessel that carries blood toward the heart

**ventricle** a muscular, thick-walled chamber of the heart that delivers blood to the arteries

**vestibule** chamber found at the base of the semicircular canals that provides information about static equilibrium

**vestigial features** rudimentary structures with no useful function

**villi** small, fingerlike projections that extend into the small intestine to increase surface area for absorption

## W

**water table** the boundary between the layer of soil that is saturated with water, and the unsaturated soil above it

**watershed** the land that drains toward a lake or other body of water

**wax** a long-chain lipid that is insoluble in water

**why** show the cause, reason, or purpose

**wild type** the most common allele of a gene with multiple alleles

## Y

**yolk sac** a membranous sac that forms during embryo development of most vertebrates; in humans, it does not contain yolk

## Z

**zygote** the cell resulting from the union of a male and female sex cell